received
4/4/16

April 4, 2016

Jenna Calvi
Vermont Department of Environmental Conservation
Watershed Management Division
1 National Life Drive, Main 2
Montpelier, VT 05620-3522

RE: MMMUSD – GP 3-9015
River Road, Jericho, VT

Dear Jenna,

We are writing on behalf the Mount Mansfield Modified Union School District to apply for coverage under General Permit 3-9015. The project is located on River Rd in Jericho, north of Mills Riverside Park. This project proposes to make improvements to parking areas and sidewalks at the Browns River Middle School and Underhill ID Elementary School. The project utilizes a grass swale, infiltration trench, and disconnection of impervious surface for the treatment of stormwater. The project site is within the Browns River watershed, which is not listed as stormwater impaired in the State of Vermont. We understand that there is limited capacity for purchasing a phosphorus offset. We are submitting this General Permit 3-9015 application in anticipation of the issuance of the EPA TMDL for Lake Champlain.

We have enclosed the following for your review:

- NOI for General Permit 3-9015 & $ 781.80 check to cover the application fee
- Schedule A for S/N 001 with supporting application materials
- 11 x 17 copies of plan sheets 8 and ST1
- CD containing PDF files of all application documents

Please contact our office with any questions.

Sincerely,

Chris Day, E.I.

c: MMMUSD c/o Jeff Forward

P:\2013\13113\Stormwater\Application documents\Cover letter calvi.docx

NOTICE OF INTENT (NOI) TO DISCHARGE STORMWATER PURSUANT TO GENERAL PERMIT 3-9015

VERMONT DEPARTMENT OF ENVIRONMENTAL CONSERVATION
WATERSHED MANAGEMENT DIVISION

For Dept. Use Only

Notice of Intent No:

Submission of this Notice of Intent (NOI) constitutes notice that the applicant(s) requests authorization to discharge stormwater for their project listed below pursuant to Chapter 18: Stormwater Management Rule and General Permit 3-9015. To obtain authorization, the applicant must submit a complete and accurate NOI, as well as all required supporting materials. Submission of an NOI does not confer coverage under GP 3-9015. Please carefully read all guidance information in the Narrative Template and Application Requirements Document before signing.

1. Applicant(s) Information[1] (*starred fields in Section 1 are required)

A. Applicant Name(s)*: Mount Mansfield Modified Union School District

Address of Applicant(s)*: P.O. Box 282

City*: Richmond State*: VT Zip*: 05477

Telephone Number*: 434-2128 E-mail Address*: jeff.forward@cesuvt.org

B. Additional Applicant Name(s) if necessary: _____

Address of Applicant(s): _____

City: _____ State: _____ Zip: _____

Telephone Number: _____ E-mail Address: _____

C. Applicant* A is the current land owner. (Fill in A or B)

Applicant* A will be billed for the annual operating fee and be the primary contact for correspondence with the Stormwater Program. (Fill in A or B)

[1]The applicant(s) shall be the owner and operator. If the applicant is a business, the business must be registered with the Vermont Secretary of State. If the application is made in connection with a new housing or commercial development, the developer and an owners' association accepting responsibility for the stormwater management system shall apply as co-permittees [§18-308 (b)(4)]. For projects that require listing more than two applicants, please attach an additional page.

2. Application Preparer/ Consultant Information

Application Preparer Name: Andrew Rowe

Application Preparer Company: Lamoureux & Dickinson

Address of Application Preparer: 14 Morse Drive

City: Essex State: VT Zip: 05452

Telephone Number: 878-4450 E-mail Address: Andy@LDengineering.com

3. Project Information

A. Is this NOI being submitted in connection with a subdivision (includes, but is not limited to residential and commercial subdivisions, universities, industrial parks, and ski areas)? YES ☐ NO ☑

B. Existing Stormwater Permit/Authorization Number related to this project (if any): none

C. Is this an amendment to an existing Stormwater Permit/Authorization? YES ☐ NO ☑

If yes: I have contacted the district analyst to determine application review fees. YES ☐ NO ☐

If yes: you must submit a complete application package with all materials to be covered under the authorization regardless of whether or not they have changed since the original application.

D. Have you or will you be submitting an NOI for coverage under a Stormwater Construction Discharge Permit? YES ☑ NO ☐

E. Does the project involve activities that are classified as stormwater hotspots? YES ☐ NO ☑

F. Project Name: MMMUSD Proposed Parking and Circulation Improvements

G. J. Project Physical Address:

H. Street Address: 10 River Rd & 20 River Rd

Town: Jericho County: Chittenden Zip: 05465

I. Project Coordinates (project center in Decimal Degrees with 6 digits to the right of the decimal):

Latitude: 44.518510 Longitude: -72.944870

1. Receiving Water(s)[2] Browns River

J. Number of Discharge Points: 1

K. Parcel(s) SPAN: Enter the 11-digit number that is printed on the property tax bill for the applicable parcel(s). Projects that involve more than 1 parcel shall list all applicable SPANs.

33325311785

33325310349

M. Project Description: Briefly describe the project. (If an amendment, please describe the previously permitted project and the proposed change to the previously permitted project.):

This project involves changes to site circulation and parking expansion at the Browns River Middle School and Underhill ID Elementary School.

[2] Receiving water is the name of the waterbody that runoff from the site first enters. In the case of an unnamed water, specify that the receiving water is an unnamed tributary, or wetland, etc. and state the first named receiving water downstream (e.g. unnamed tributary to Trout Brook). See Schedule A section of the Application Requirements for further information.

4. Manner of Discharge

A manner of discharge is required for each discharge point of the project. The manner of discharge shall specify the type of impervious surfaces, the conveyance, and type of treatment proposed to meet applicable treatment standards, and shall describe the stormwater outfall to the specified receiving water.

S/N 001: Stormwater runoff from *[list impervious surfaces]* via *[describe conveyance]* to *[treatment practices]* discharging to *[Receiving water].*

S/N 001: *Stormwater runoff from warehouse building rooftop on Lot 2 and a portion of access road, via sheet flow to grass channel #1, all routed to a wet pond with pre-treatment forebay, discharging by controlled outlet structure and stabilized outfall to Trout Brook. Additional runoff from building rooftop on Lot 3, is disconnected in accordance with Disconnection of Rooftop Runoff Credit, discharging overland to Trout Brook*

Use the format and example above to provide a written manner of discharge for each discharge point. If more space is needed, provide an additional sheet.

S/N 001: Stormwater runoff from parking areas, via sheet flow to an Infiltration Trench forebay, routed to a catch basin and into Infiltration Trench, routed to storm piping discharging to Browns River. Runoff from parking areas, via sheet flow a Grass Channel, routed to existing storm piping discharging to Browns River. Additional runoff from sidewalks and parking area, are disconnected in accordance with the Disconnection of Non-Rooftop Runoff Credit.

5. Plan Set Reference

Provide a complete list of all plans applicable to the stormwater management design that have been included with this application. Specify who the plans have been prepared by (e.g. Fairweather Stormwater Design, Inc.) and list the plans using the following format: Sheet *[##]*, "*[Sheet Title]*," dated *[mm/dd/yyyy]*, last revised *[mm/dd/yyyy]*; (e.g. Sheet 1, "Existing Condition Plan", dated 01/15/2014, last revised 02/06/2014).

Dated plans are required. Using the above format enter the plan set reference for the project in the space below. If more space is required, provide an attachment.

Design firm: Lamoureux & Dickinson Engineers

Sheet 8 "Stormwater Details & Specifications" dated 03-28-2016
Sheet ST1 "Stormwater Treatment Plan" dated 03-28-2016

6. Impervious Area Summary

Complete the following table with the appropriate impervious acreage as applicable. Round all areas to the nearest **0.01 acres**. For definitions of new impervious surface, expanded impervious surface, redevelopment and existing impervious surface, see Chapter 18: Stormwater Management Rule http://www.anr.state.vt.us/dec/waterq/stormwater/docs/sw_rule-unimpaired.pdf

Impervious Surfaces Proposed for Coverage		
1. **New/Expanded Impervious Area:**	0.63	Acres
2. **Redeveloped Impervious Area:**	0.00	Acres
3. **If this is an amendment**[3] Previously Permitted Impervious Area:	0.00	Acres
4. **Total impervious area to be permitted for this project:** (Add lines 1+2+3)	0.63	Acres
5. **Total Area for application fee calculation:** (For new projects add lines 1+2, for amendments see below[3]. Carry this value over to following page.)	0.63	Acres

[3] *If the current application is an amendment, contact the District Analyst who covers the Project Town prior to submitting this NOI to determine if a full review fee is required.*

IMPORTANT: DO NOT include impervious area in the fee calculation unless the stormwater runoff from the surface will meet the applicable treatment standards set forth in the Vermont Stormwater Management Manual.

This impervious surface breakdown as completed above MUST match the total impervious surfaces presented in the Schedule A's completed for the discharge points in your application. If these totals do not match, your application will be returned to you as administratively incomplete.

7. Permit Application Fees (Per 3 V.S.A. Sec. 2822)

Administrative Processing Fee	$240.00 (standard)	**$240.00**
Application Review Fee	0.63 total impervious acres X $860 per impervious acre (Class B waters)*	$ 541.80 (A minimum app. review fee of $440 applies)
	_____ total impervious acres X $1400 per impervious acre (Class A waters)*	$ 0.00 (A minimum app. review fee of $1400 applies)
	* Water classification can be found here: http://www.anr.state.vt.us/dec/waterq/erp/docs/erp_wqs.pdf	
Total Permit Application Fees	**Enclosed Check#** _____ **Paid by:** _____	$ 781.80

Include a check payable to State of Vermont for the appropriate permit fees. Do not send a copy of the check. Round impervious acreage to nearest 0.01 acre.

8. Certification of Complete Application and Designer Certification

Please carefully read all guidance information in the Narrative Template and Application Requirements Document before signing.

A complete application shall contain the following items saved as separate PDFs:

- **A complete NOI form**
- **Attachment 1: Narrative.** Narrative, Location Map and Soils Map (see Narrative Guidance).
- **Attachment 2: Worksheets.** Schedule A's, waivers and BMP worksheets. These shall be grouped by discharge point (see Application Requirements Document) .
- **Attachment 3: Modeling.** Hydrologic modeling for the existing and proposed conditions including the pertinent storm events; WQv, 1-year, 10-year and 100-year storm (see Application Requirements Document, Modeling Section).
- **Attachment 4: Plans.** Pertinent plan sheets with legend, scale bar and north arrow for the existing condition and proposed condition, as well as a detail plan sheet (see Application Requirements Document, Plan Sheet Section).

Designer Certification: I hereby certify that I have reviewed the Application Requirements Document and have included the required information with this NOI. I hereby certify that the design-related information submitted with the NOI for coverage under General Permit 3-9015 was prepared under my direction or supervision and that the information is, in the exercise of my reasonable professional judgment, true, accurate and complete. I also hereby certify that the stormwater collection, treatment and control system design submitted with this application **complies with DEC's Stormwater Management Rule and the Vermont Stormwater Management Manual.**

Signature of Stormwater Designer[4]

4/4/16

Date

Andrew Rowe, Engineer

Designer Name and Title

Lamoureux & Dickinson

Company Name (if applicable)

[4]**Please sign the document electronically. If you cannot sign electronically, please only submit the signatures page in the paper form, do not scan entire NOI.**

9. Applicant(s) Certification

An authorized representative of each applicant as listed in Section 1 of this NOI shall complete the section below. If additional space is needed, the applicant may attach additional copies of this page to the NOI.

I hereby certify that I have read General Permit 3-9015 (http://www.vtwaterquality.org/stormwater/htm/sw_3-9015.htm) and agree to abide by its terms. I understand that there will be annual reporting requirements and annual operating fees based on the amount of impervious permitted herein.

Signature of Owner or Authorized Representative[5]

Facilities Coordinator
Title

Jeff Forward
Type Name

4/1/2016
Date

Signature of Operator or Authorized Representative[5]

Facilities Coordinator
Title

Jeff Forward
Type Name

4/1/2016
Date

Please sign the document electronically. If you cannot sign electronically, please only submit the signatures page in the paper form, do not scan entire NOI.

[5] If the applicant is a business, the signature must be provided by one of the following: i) the person listed as the registered agent with the Secretary of State; ii) an executive figure such as the president, chairperson or superintendent, or; iii) an individual whose status as an authorized representative is verified in writing by the registered agent or executive figure. If the applicant is an individual, but the NOI is being signed by an authorized representative, a letter from the applicant stating that that person is the authorized representative must accompany this NOI.

MMMUSD Proposed Parking and Circulation Improvements
Jericho, VT

Table of Contents

Attachment 1

Narrative

Location Map

Soils Map

Attachment 1: Narrative, Location Map, and Soils Map
MMMUSD Proposed Parking and Circulation Improvements

1. **Introduction**
   Lamoureux & Dickinson is writing on behalf of Mount Mansfield Modified Union School District to apply for a State Stormwater Discharge Permit pursuant to General Permit 3-9015 for the above referenced project.

2. **Project Description**
   This project is located on the east side of River Road, north of Mills Riverside Park in Jericho. The existing land use consists of the Underhill ID Elementary School and Browns River Middle School. The project site has two entrances off River Road that form a loop in front of the Browns River Middle School. The proposed improvements to the site include new sidewalks and parking area expansions. This project requires a Stormwater Discharge Permit pursuant to General Permit 3-9015 for the expansion of impervious surfaces at a site with greater than 1 acre of existing impervious surfaces.

3. **Existing Condition**
   Existing impervious area on the project site includes buildings, paved and gravel parking areas and sidewalks. Pervious area on site consists mostly of mowed grass. The site slopes gently towards the east and has one discharge point at the Browns River. Soils within the project area consist of Stetson gravely fine sandy loam (Hydrologic Soil Class A).

4. **Existing Stormwater System**
   Stormwater runoff is managed through a combination of overland flow and collection pipes routed directly to the Browns River. There are no treatment practices on site that are specifically designed to meet the 2002 VSWM rules. Much of the impervious area, however flows across vegetated areas before reaching the discharge point.

5. **Proposed Stormwater System:**
   i) Description of Impervious Area:

   Existing impervious: 4.57 acres
   New impervious 0.63 acres

   ii) Receiving Body: Browns River
   iii) Fish Habitat Designation for Receiving Water: Cold

   iv) Description of compliance with each of the 5 Unified Sizing Criteria in the 2002 VSMM Vol. I including the treatment practices or credits/waivers used to meet each of the following standards:

(a) Water Quality Treatment Standard (WQv):
   1. S/N 001: WQv for this area is met with an Infiltration Trench I-1, Grass Channel O-3 and disconnection of non-rooftop runoff.

(b) Groundwater Recharge Treatment Standard: REv for this area is met with Infiltration Trench I-1, Grass Channel O-3 and disconnection of non-rooftop runoff.

(c) Channel Protection Standard (CPv):
   1. S/N 001: CPv is waived for this site.

(d) Overbank Flood Protection Standard (Q_p10) :
   1. S/N 001: Q_p10 is waived for this site.

(e) Extreme Flood Protection Standard (Q_p100) :
   1. S/N 001: Q_p100 is waived for this site.

There are three isolated areas of new impervious surface included in the total amount to be permitted that are not included in the site area computations. Treatment of these areas is provided with the Non-rooftop Disconnection Credit.

Infiltration Trench Details:
The Infiltration Trench design uses a sediment forebay as pretreatment. Overflow from the forebay enters the infiltration trench through a catch basin. Since stormwater enters the infiltration trench following a pretreatment forebay, through a closed pipe system, there is limited potential for erosion or erosive runoff velocities. The infiltration trench has been designed to temporarily store runoff and includes a 6" diameter overflow orifice for larger storm events. Catch basins on either end of the Infiltration Trench will allow for inspection, observation, and maintenance. All catch basins will have inlet protection.

Three infiltration tests were performed along the length of the proposed infiltration trench. Infiltration rates ranged from 51 inches per hour to 84 inches per hour. A design infiltration rate of 15 inches per hour has been used in the attached calculations. Three soil borings were also performed along the length of the proposed infiltration trench, revealing stony loamy fine sand to typical depth of 2 feet, with fine sandy gravel below. There will be at least 3 feet between the bottom of the infiltration trench and the seasonal high groundwater level.

The following items are attached for review:

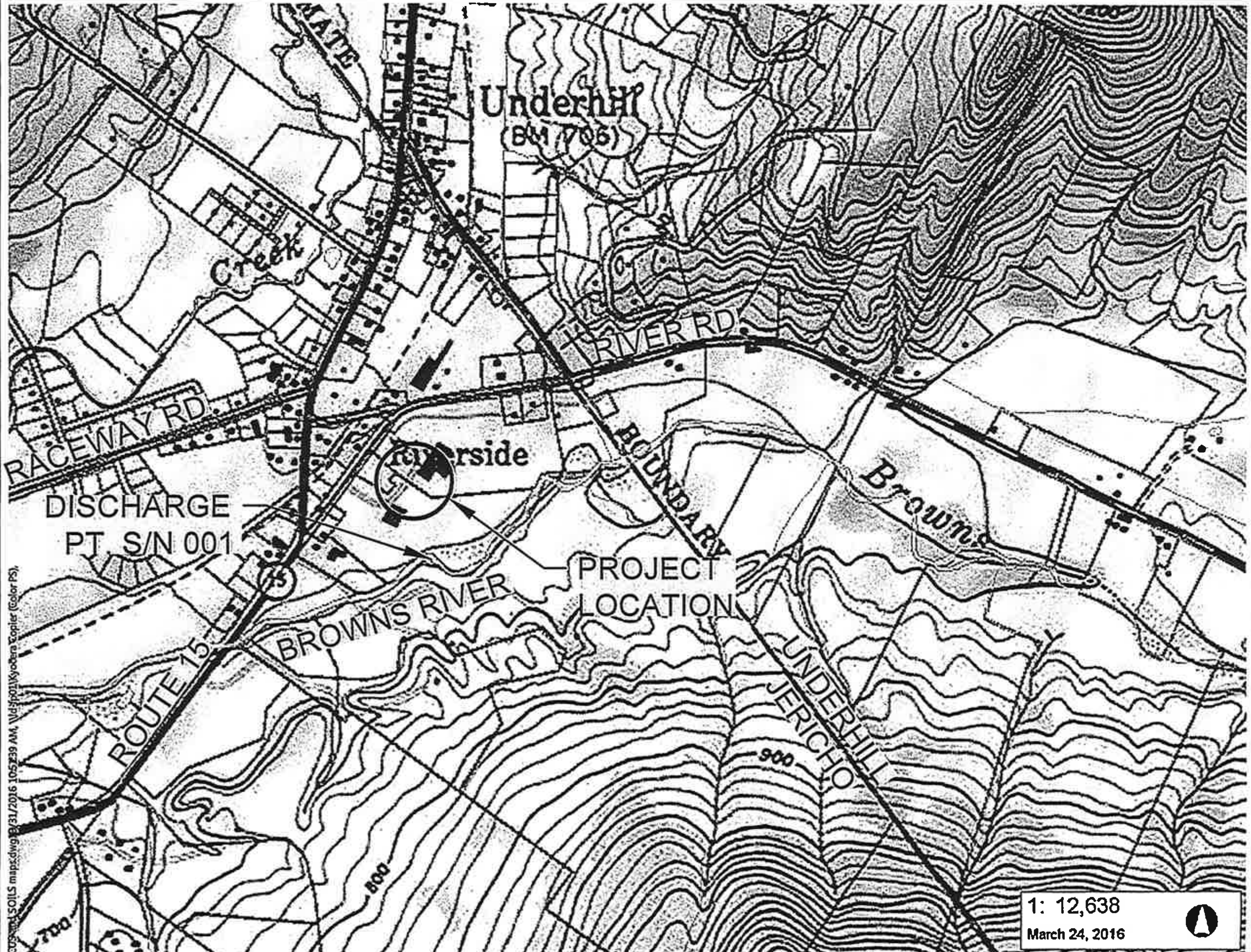
- **Complete NOI form**
- **Attachment 1: Narrative:** Narrative, Location Map and Soils Map.
- **Attachment 2: Worksheets:** Schedule A's, waivers and BMP worksheets- grouped by discharge point.

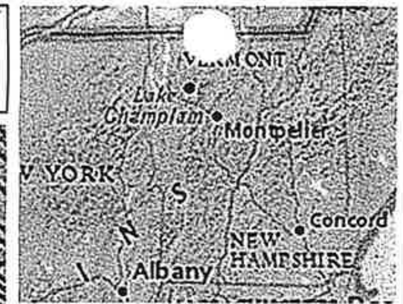
- **Attachment 3: Modeling:** Runoff modeling and calculations demonstrating compliance with the applicable treatment standards.
- **Attachment 4: Plans:** Pertinent plan sheets with all required information outlined in Part 5 of the General Guidance Document.
- **A check** in the amount of $ 781.80 Payable to "State of Vermont".

Project Location Map

Vermont Agency of Natural Resources

vermont.gov





LEGEND

- Waterbody
- Stream
- Parcels (where available)
- Town Boundary

NOTES

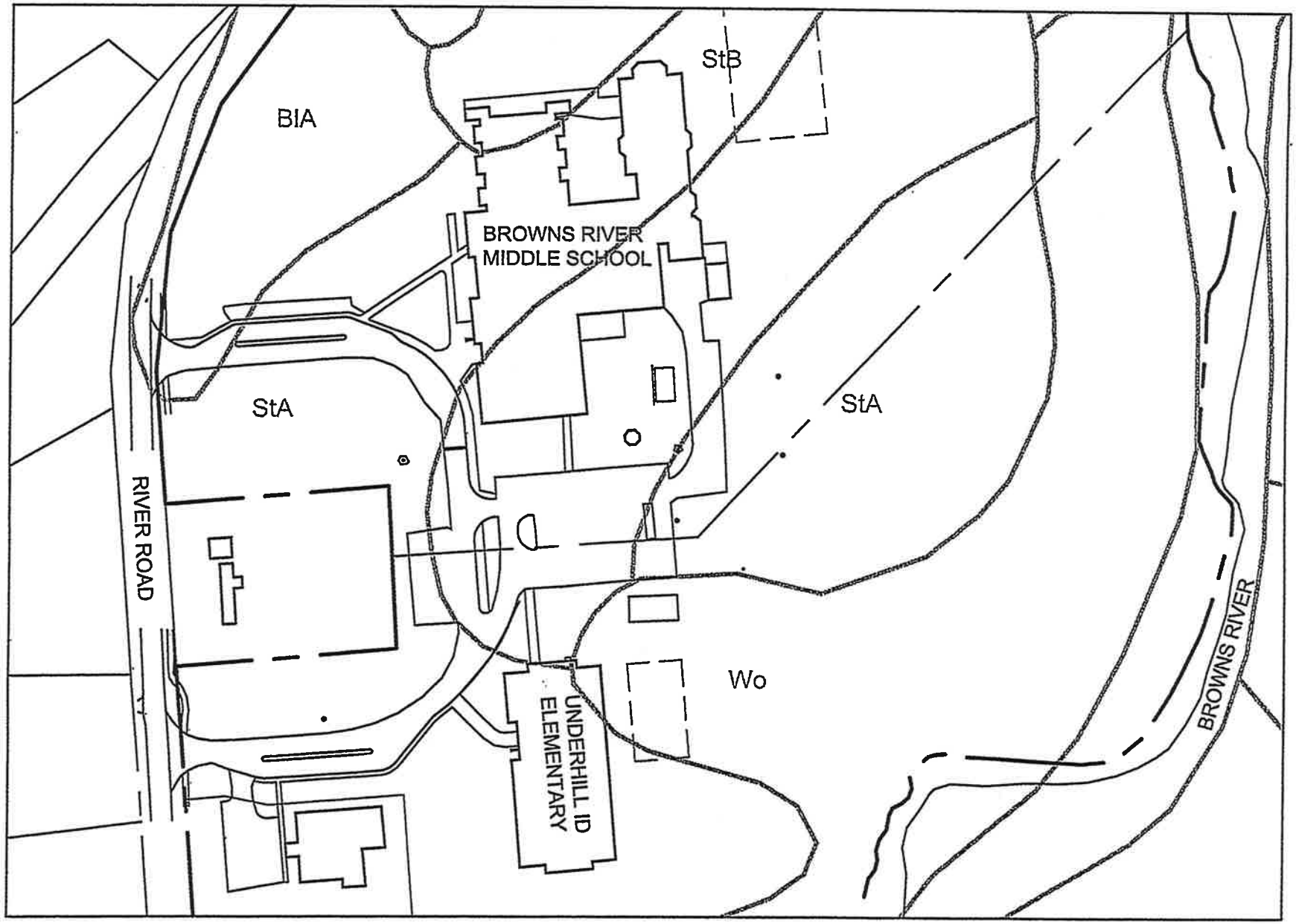
642.0 0 321.00 642.0 Meters

WGS_1984_Web_Mercator_Auxiliary_Sphere
© Vermont Agency of Natural Resources

1" = 1053 Ft. 1cm = 126 Meters

THIS MAP IS NOT TO BE USED FOR NAVIGATION

DISCLAIMER: This map is for general reference only. Data layers that appear on this map may or may not be accurate, current, or otherwise reliable. ANR and the State of Vermont make no representations of any kind, including but not limited to, the warranties of merchantability, or fitness for a particular use, nor are any such warranties to be implied with respect to the data on this map.



SOILS MAP

SCALE: 1" = 200'

KEY	DESCRIPTION
BIA	BELGRADE & ELDRIDGE LOAMY FINE SAND
StA	STETSON GRAVELLY FINE SANDY LOAM
StB	STETSON GRAVELLY FINE SANDY LOAM
Wo	WINOOSKI VERY FINE SANDY LOAM

Attachment 2

Worksheets

Version 2-2015

Vermont Stormwater Discharge Permit Application

Schedule A

Fill out one Schedule A for each discharge point. For each Standard Treatment Practice (STP), Credit or Waiver specified, a STP, Credit, and/or Waiver worksheet must also be included.

Line

General Discharge Point Information

Project name	MMMUSD Proposed Parking and Circulation Improvements
Discharge point serial number (e.g. S/N 001)	S/N 001
Name of receiving water	Browns River
Latitude & Longitude of discharge point (Decimal Degree format with 6 digits to the right of the decimal):	44.517318 & -72.944397
Site area draining to discharge point (acres) = impervious + disturbed pervious	1.32

On-site impervious area included for permit coverage *(Round to nearest 0.01 acre)*

New Impervious area contributing stormwater runoff to discharge point (acres)	0.63
Redeveloped impervious area* contributing stormwater runoff to discharge point (acres)	0.00
Existing Impervious area* contributing to stormwater runoff to discharge point (acres)	0.00
Total	0.63

***DO NOT include impervious area unless it has met the Vermont Stormwater Treatment Standards 2002. If using the site balancing procedure refer to General Guidance Document.**

Water Quality (0.9 inches) Treatment Standard (WQ)

STP used (e.g. Grass Channel O-3)	Grass Channel (O-3), Infiltration Trench (I-1)
Voluntary Stormwater Management Credits applied (e.g. Grass Channel Credit 3.5)	Credit 3.3 - Disc. Non-Rooftop

Groundwater Recharge Treatment Standard (Re)

Criterion applicable? (Yes or No) If No, indicate waiver applied	Yes
STP used (e.g. Grass Channel O-3)	Grass Channel (O-3), Infiltration Trench (I-1)
Voluntary Stormwater Management Credits applied (e.g. Grass Channel Credit 3.5)	Credit 3.3 - Disc. Non-Rooftop

Channel Protection (1-year) Treatment Standard (CP)

Criterion applicable? (Yes or No) If No, indicate waiver applied	No Less Than One Acre
Warm or Cold Fish Habitat Designation (see Vermont Water Quality Standards)	Cold - 12 Hours/720 Minutes
STP used (e.g. Wet Pond P-2)	N/A

Overbank (10-year) Flood Protection Treatment Standard (Qp10)

Criterion applicable? (Yes or No) If No, indicate waiver applied	No Receiving Water > 10 Square Miles
STP used (e.g. Dry Detention Pond LA-1)	N/A
Pre-development peak discharge rate (cfs)	
Pre-routed, post-development peak discharge rate (cfs)	
Routed, post-development peak discharge rate (cfs)	

Extreme (100-year) Flood Protection Treatment Standard (Qp100)

Criterion applicable? (Yes or No) If No, indicate waiver applied	No Receiving Waters > 10 Square Miles
STP used (e.g. Dry Detention Pond LA-1)	N/A
Pre-development peak discharge rate (cfs)	
Pre-routed, post-development peak discharge rate (cfs)	
Routed, post-development peak discharge rate (cfs)	

Version: 9/06

For the area draining to*: Infiltration Trench I-1

Located in drainage area for S/N: 001

WQ Volume Calculation for Volume-Based Practice

Use this worksheet to calculate the water quality volume draining to your volume based STP if you are not using any of the site design credits in section 3 of the 2002 VSWMM. Do not use this worksheet to calculate your WQv if you need to determine the Peak Q for the WQ storm (i.e. designing a grass channel, flow-splitter or other flow based practice). See the worksheet "Water Quality Volume and Modified Curve Number Calculation for Water Quality Treatment in a Flow-Based Practice"

Water Quality Volume Calculations

Line			value/calculation	units
1	Site Area (impervious + disturbed pervious)	A=	0.50	acres
2	Impervious area		0.21	acres
3	Percent Impervious Area = [(line 2/line 1) * 100] =	I =	42.00	% (whole #)
4	Precipitation	P =	0.9	inches
5	Runoff coefficient calculation = (0.05 + (0.009*I))	Rv =	0.428	
6	WQ Volume (in watershed inches) Calculation =(P * Rv) =		0.385	Qa (watershed inches, a.k.a. inches of runoff)
7	Minimum WQ Volume[1]		0.2	watershed inches
8	Enter the greater of line 6 or line 7	WQv =	0.385	watershed inches
9	WQ Volume Calculation = (line 8 *A)/12 =	WQv =	0.016	ac. ft.
10	WQ Volume Calculation = (line 9 * 43560) =	WQv =	699	cu. ft.

Notes:

1: Sites with low impervious cover (~19%) but that do not employ a significant use of the stormwater design credits in Section 3 of the VSWMM are required to treat the minimum water quality volume of 0.2 watershed inches. Sites that have a significant portion of their impervious cover addressed via the stormwater credits (section 3 of the VSWMM) will be able to reduce this WQv and will only be required to treat the volume calculated on the "WQ Volume (with credit reduction)" worksheet which will be less than the 0.2 watershed inches.

* Enter the name of the STP (both type and label) which has been designed to treat this particular WQv (e.g. Wet Pond #2)

Version: 2/12

For the area draining to*: Grass Channel (DA2)

Located in drainage area for S/N: 001

Groundwater Recharge Treatment Standard - Calculation & Waiver Worksheet

The average annual groundwater recharge rate for the prevailing hydrologic soil group(s) (HSG) must be maintained in order to preserve existing water table elevations. Recharge is determined as a function of annual predevelopment recharge for a given HSG, the average annual rainfall and the amount of impervious surface at the site. The Groundwater Recharge Treatment Standard can be met by using one or both of the following methods: volume method and/or percent area method. See Table 2.2 in the VSMM - Volume I for a list of acceptable STPs or credits that satisfy this requirement. Use NRCS's Web Soil Survey to obtain specific soil data at your site, available at: http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm

Site Information

		value/calculation	units
Site Area (impervious + disturbed pervious)	A=	0.82	acres
Impervious area		0.39	acres
Percent Impervious Area = [(line 2/line 1)] =	I=	0.48	% (decimal percent)

Composite Recharge Factor Calculation

Enter site acreage of each HSG draining to POI or S/N

	value/calculation	
HSG A	0.82	acres
HSG B		acres
HSG C		acres
HSG D		acres
Total Site Area	yes	
Composite Recharge Factor	0.400	

ReV (Percent Volume Method)	0.013	acre feet
	555	cubic feet

The percent volume method is commonly used to meet recharge. Designers must demonstrate that a proposed STP allows at least the Rev to enter the ground. The Rev is contained within the WQv. So, if a practice is infiltrating the entire WQv, then Rev is automatically met. Please use the applicable STP worksheets to verify the Groundwater Recharge Treatment Standard has been met. Note that not all STPs can be used to meet this standard.

ReA (Percent Area Method)	0.156	acres
	6795	square feet

The percent area method is used when meeting recharge via nonstructural design credits(disconnection of rooftop/non-rooftop surfaces, stream buffer, grass channel credit, or ESRD). In this case, the designer must demonstrate that stormwater runoff from a portion of the new impervious area, equivalent to the area calculated under the percent area method, drains into a nonstructural design credit practice.

Additional notes:

*Recharge is one of the unified sizing criteria that can be achieved site wide, rather than at each point of interest (POI) or discharge point (S/N), assuming the receiving water is the same for each discharge point.

* Enter the name of the STP (both type and label) which has been designed to treat this particular Rev or Rec

Version: 9/06

For the area draining to*: Infiltration Trench I-1

Located in drainage area for S/N: 001

WQ Volume Calculation for Volume-Based Practice

Use this worksheet to calculate the water quality volume draining to your volume based STP if you are not using any of the site design credits in section 3 of the 2002 VSWMM. Do not use this worksheet to calculate your WQv if you need to determine the Peak Q for the WQ storm (i.e. designing a grass channel, flow-splitter or other flow based practice). See the worksheet "Water Quality Volume and Modified Curve Number Calculation for Water Quality Treatment in a Flow-Based Practice"

Water Quality Volume Calculations

Line			value/calculation	units
1	Site Area (impervious + disturbed pervious)	A=	0.50	acres
2	Impervious area		0.21	acres
3	Percent Impervious Area = [(line 2/line 1) * 100] =	I =	42.00	% (whole #)
4	Precipitation	P =	0.9	inches
5	**Runoff coefficient calculation** = (0.05 + (0.009*I))	Rv =	0.428	
6	**WQ Volume (in watershed inches) Calculation** =(P * Rv) =		0.385	Qa (watershed inches, a.k.a. inches of runoff)
7	Minimum WQ Volume[1]		0.2	watershed inches
8	Enter the greater of line 6 or line 7	WQv =	0.385	watershed inches
9	**WQ Volume Calculation** = (line 8 *A)/12 =	WQv =	0.016	ac. ft.
10	**WQ Volume Calculation** = (line 9 * 43560) =	WQv =	699	cu. ft.

Notes:

1: Sites with low impervious cover (~19%) but that do not employ a significant use of the stormwater design credits in Section 3 of the VSWMM are required to treat the minimum water quality volume of 0.2 watershed inches. Sites that have a significant portion of their impervious cover addressed via the stormwater credits (section 3 of the VSWMM) will be able to reduce this WQv and will only be required to treat the volume calculated on the "WQ Volume (with credit reduction)" worksheet which will be less than the 0.2 watershed inches.

* Enter the name of the STP (both type and label) which has been designed to treat this particular WQv (e.g. Wet Pond #2)

Version: 9/06

For the area draining to*: Grass Channel O-3

Located in drainage area for S/N: 001

WQ Volume and Modified Curve Number Calculation for Water Quality Treatment in Flow-Based Practice

Use this worksheet to calculate your WQv if you need to determine the Peak Q for the WQ storm (i.e. designing a grass channel, flow-splitter or other flow based practice) and you are not using any of the site design credits in section 3 of the 2002 VSWMM. See page 2 for "Calculating Peak WQ Discharge Rate (0.9" storm) using the Modified Curve Number." Please note that in the case of grass channels you must include any off-site area draining to the practice as this will affect the peak discharge rate which will ultimately affect the hydraulics, and thus residence time, in your channel.

Water Quality Volume Calculations

Line			value/calculation	units
1	Area draining to practice	A=	0.82	acres
2	Impervious area		0.39	acres
3	Percent Impervious Area = [(line 2/line 1) * 100] =	I =	47.56	% (whole #)
4	Precipitation	P =	0.9	inches
5	Runoff coefficient calculation = (0.05 + (0.009*I))	Rv =	0.478	
6	WQ Volume (in watershed inches) Calculation =(P * Rv) =		0.430	Qa (watershed inches, a.k.a. inches of runoff)
7	Minimum WQ Volume[1]		0.2	watershed inches
8	Enter the greater of line 6 or line 7	WQv =	0.430	watershed inches
9	WQ Volume Calculation = (line 8 *A)/12 =	WQv =	0.029	ac. ft.
10	WQ Volume Calculation = (line 9 * 43560) =	WQv =	1281	cu. ft.

Notes:

1: Sites with low impervious cover (~19%) but that do not employ a significant use of the stormwater design credits in Section 3 of the VSWMM are required to treat the minimum water quality volume of 0.2 watershed inches. Sites that have a significant portion of their impervious cover addressed via the stormwater credits (section 3 of the VSWMM) will be able to reduce this WQv and will only be required to treat the volume calculated on the "WQ Volume (with credit reduction)" worksheet which will be less than the 0.2 watershed inches.

* Enter the name of the STP (both type and label) which has been designed to treat this particular WQv (e.g. Wet Pond #2)

Version: 9/06

For the area draining to*: Grass Channel O-3

Located in drainage area for S/N: 001

Calculating Peak WQ Peak Discharge Rate (0.9" storm) using the Modified Curve Number

Because NRCS methods underestimate the peak discharge for rainfall events of less than 2", simply plugging in 0.9" of rainfall into your hydrologic model with the standard curve numbers will not produce the correct peak discharge during the WQv storm, nor will it produce a volume of runoff equivalent to that which you have calculated using the WQv formula (WQv = P*Rv*A/12). In order to calculate the peak discharge for the 0.9" storm, a modified curve number must be calculated. This modified curve number is based on the runoff (in inches) calculated using the short cut method formula (WQv = P*Rv) that is also the basis of the familiar WQv calculations provided in the 2002 VSWMM (and on the WQv calculation worksheets). Essentially, the curve number that is calculated using the methods below is the curve number that will generate the volume of runoff calculated using the WQv formula.

Above, you should have calculated the **WQv in watershed inches draining to the facility/practice** for which you need to calculate the WQ-peak discharge. As provided in the guidance listed on the grass channel worksheet, please remember that the WQv calculation should include runoff from on-site as well as **off-site** area draining to the grass channel since this will have an impact on the channel hydraulics and thus the velocity and residence time.

Steps:

1. Transfer information from WQv calculation worksheets.

Enter the Qa (line 8 from WQv sheet)

Qa = 0.430 inches

Enter the area (site +off-site draining to practice) used in calculating the percent impervious (I)

A = 0.8 acres

2. Use the following equation to calculate a corresponding curve number

where P = 0.9 inches

CN = 1000/(10 +(5*P)+(10*Qa) - (10*(Qa^2 + (1.25*Qa*P))^0.5))

CN = 94.1

3. If you are using **hand hydrologic runoff calculations,** use the computed CN above along with your calculated time of concentration and the drainage area (A) to calculate the peak discharge (Qwq) for the water quality storm using the TR-55 Graphical Peak Discharge Method.

OR

3. If you are using a computer aided hydrologic model, simply revise the curve number for your subwatershed(s) draining to the practice using the curve number calculated above; the computed curve number should be applied to the total area (A) used in the WQv calcuation. As a check, you should note that now when you run the 0.9" storm, your runoff depth should be roughly equal to Qa (WQ runoff in inches) and your total runoff volume roughly equal to your WQv (in ac. ft.). If this is not the case, make sure that the time span for your modelling run is long enough to capture the entire storm. Small variations are likely due to having to round your computed CN to a whole number. Remember that for storms larger than 2", you do not need to use the modified curve number and you should calculate your composite curve number based on the accepted values for different types of land-use (see TR-55).

* Enter the name of the STP (both type and label) which has been designed to treat this particular WQv (e.g. Wet Pond #2)

Version: 4/10

Project Name: MMMUSD Propsoed Parking and Circulation Improvements
Discharge Point: S/N 1

Infiltration Trench (I-1)

Infiltration Trench # 1

Line Indicate the treatment standards met for the site area draining to this practice:

1 WQv ☑
2 Rev ☑
3 Cpv ☐
4 Qp10 ☐
5 Qp100 ☐

{ To provide Cpv, Qp10 or Qp100 infiltration rates must be >5 inches/hour.

Water Quality Volume (WQv)

6	What is the WQv (cubic feet) for the site area draining to this practice (from WQv worksheets)?	699 cu-ft

Feasibility (2.7.1. A)

7	What volume (cubic feet) of water is the forebay or equivalent upstream pre-treatment is sized to contain?	811 cu-ft

		Response	Attachment location
8	Is the infiltration rate as determined by NRCS soil textural classification at least 0.5 inches per hour?	yes	Narrative
9	Has the infiltration rate been confirmed by geotechnical tests (as per VSMM - Vol. II, Appendix D1)?	yes	Narrative
10	Do soils have a clay content of less than 20% and a silt/clay content of less than 40%?	yes	Narrative
11	Has the infiltration trench been located in an area where natural slopes are less than or equal to 15%?	yes	Attachment 4 - Plans
12	Has the infiltration trench been placed on non-fill soils?	yes	Attachment 4 - Plans
13	Is the bottom of the trench seperated by three feet vertically from the seasonally high water table or bedrock layer?	yes	Narrative
14	Are all water supply wells at least 100 horizontally from the infiltration trench?	yes	Attachment 4 - Plans

	Conveyance (2.7.1.B)	Response	Attachment location
15	Has the flow path of runoff exceeding the capacity of the trench been evaluated to prevent erosion?	yes	Attachment 4 - Plans
16	If the flows exceed erosive velocities, has an overflow channel been provided to a stabilized watercourse?	yes	Attachment 4 - Plans
17	Has the infiltration trench been designed to fully dewater the entire WQv within 48 hours?	yes	Attachment 3 - Modeling

	Pretreatment (2.7.1.C)	Response	Attachment location
18	Has pre-treatment been provided for non-rooftop runoff?	yes	Attachment 1 - Narrative
19	Has the integrity of the trench been protected with grass channels, grass trench strips and a bottom sand layer?	yes	Attachment 1 - Narrative
20	Has the trench designed with a minimum 6 inch upper sand layer at the sand/gravel interface?	n/a	Attachment 4 - Plans - Trench Section
21	Does the trench use washed bank run (2 to 5 inch) gravel as aggregate?	yes	Attachment 1 - Narrative
22	Are exit velocities from the pre-treatment facility non-erosive during the overbank flood events?	yes	Attachment 1 - Narrative

22	What is the pretreatment volume?	900 cu-ft
22a	If the infiltration rate is ≤2 inches per hour, has at least 25% of the WQv been pretreated?	not applicable
22b	If the infiltration rate is >2 inches per hour, has at least 50% of the WQv been pretreated?	not applicable
22c	If the infiltration rate is >5 inches per hour, has at least 100% of the WQv been pretreated?	yes

	Treatment (2.7.1.D)	Response	Attachment location
23	Has the trench been designed to exfiltrate the entire WQv through the bottom?	yes	Attachment 3 - Modeling

24	What is the surface area of the infiltration trench?*	435 sf

*Use the equation in VSMM- Vol. I on page 2-36

	Landscaping (2.7.3.E) and Maintenance (2.7.3.F)	Response	Attachment location
25	Have notes been added indicating how sediment will be prevented from entering the trench and that all upstream construction will be complete and stablized prior to use?	yes	Attachment 4 - Plans
	Has an observation (6 inch perforated pipe) well been installed?	yes	Attachment 1 - Narrative - Catch Basins
27	Has direct access been provided to the infiltration practice for maintenance and rehabilitation?	yes	Attachment 1 - Narrative

	Cold Climate Design Considerations (2.7.1.G)	Response	Attachment location
28	Have the potential impacts of Vermont's severe winter climate been addressed in your design?	yes	Attachment 4 - Plans

Channel Protection Treatment Standard (Cpv)*

*Infiltrating the entire volume of runoff from the 1-year, 24 hour storm (preferred method)

29	What is the volume of runoff (Vr) from the 1-year, 24-hr storm?	Cpv waived

		Response	Attachment location
30	Does the infiltration trench have enough storage volume for the 1-year, 24 hour storm?	no	Cpv waived
31	Is the dewatering time for the 1-year, 24-hour storm less than 48 hours?	no	Cpv waived

Channel Protection Treatment Standard (Cpv)*

*Matching the release rate of a hypothetical pond designed to detain the entire 1-year, 24 hour storm

		Response
32	Check which detention time standard must be used, based on the fisheries designation of the receiving water:	☑ 12 hours for cold water ☐ 24 hours for warm water

		Response	Attachment location
33	Has the runoff draining to this trench been modeled as if it had been routed to a hypothetical detention pond sized to provide the above detention time? If yes, go to Line 34. If no, skip to Line 38.	no	Cpv waived

34	What storage volume (cubic feet) necessary to meet the Channel Protection Standard?	Cpv waived
35	What orifice size (inches) is necessary to provide the detention time required?	Cpv waived
36	What is the calculated average release rate (cfs)?	Cpv waived
37	What is the controlled peak release rate (cfs) during the 1-year storm as indicated by the model?	Cpv waived

	Overbank Flood Protection Treatment Standard (Qp10)	Response	Attachment location
38	Have you demonstrated that Qp10 post is less than or equal to Qp10 pre at the discharge point?*	no	Qp10 waived

*Please include runoff and routing calculations of the 10-year storm event.

	Extreme Flood Protection Treatment Standard (Qp100)	Response	Attachment location
39	Have you demonstrated that Qp100 post is less than or equal to Qp100 pre at the discharge point?*	no	Qp100 waived

Cpv waived

See VSMM-Vol. II, Appendix D1 for guidance regarding infiltration testing requirements.
Attachment location: Indicate the specific location (i.e. appendix, page, plan sheet) where the requisite support documentation has been provided within the application.

Version: 4/10

Project Name: UUUMSD Proposed Parking and Circulation Improvements
Discharge Point: S/N 1

Grass Treatment Channel (O-3)

Grass Treatment Channel #__1__

Line **Treatment Standards**

Indicate the treatment standards met for the site area draining to this practice:

Line			
1	WQv	☑	
2	Rev	☑	This practice automatically meets Rev if you have met the WQv treatment standards
3	Cpv	☐	
4	Qp10	☐	Grass channels are not typically appropriate to provide Cpv, Qp10 or Qp100 except under ideal conditions.
5	Qp100	☐	

	Modified Curve Number	Modified CN*
6	What is the modified curve number (CN) for both on and off-site areas draining to this facility?	94

	Water Quality Volume (WQv)	WQv (Cubic Feet)
7	Provide the WQv for both on and off-site area draining to this facility (from WQv worksheets)?	1,281

		WQ Peak (Cfs)
8	What is the peak discharge rate associated with the WQ storm?	0.48

	Feasibility (2.7.5.A)	Response	Attachment location
9	Is the maximum longitudinal slope of the channel 4% or less?	yes	Attachment 4 - Plan Sheet 8

	Conveyance (2.7.5.B)	Response	Attachment location
10	Is the peak velocity for the 1-year storm non-erosive?	yes	Attachment 3b - Modeling
11	Are the channel slopes less than or equal to the 2:1 maximum?	yes	Attachment 4 - Plan Sheet 8
12	Does the channel safely convey the 10-year storm with a minimum of 6 inches of freeboard?	yes	Attachment 3b - Modeling
13	Was the Manning's n value adjusted for the depth of water in the channel for larger storm events?	yes	Attachment 3b - Modeling

	Pretreatment (2.7.5.C)	Response	Attachment location
14	Has pre-treatment been provided for non-rooftop runoff?	yes	Attachment 4 - Sheet ST1

	Treatment (2.7.5.D)	Channel Width (Feet)
15	What is the bottom width of the channel? (no greater than 8 feet, but no less than 2 feet)	5 feet

		Response	Attachment location
16	Is the average residence time of the WQv peak discharge at least 10 minutes?	yes	Attachment 3a - Modeling
17	Is the velocity of the WQv peak discharge less than 1 foot/second?	yes	Attachment 3a - Modeling
18	Is the depth of the WQv peak discharge 4 inches or less?	yes	Attachment 3a - Modeling
19	Were check dams used to meet the requisite treatment design criteria?	no	Attachment 4 - Plan Set

	Cold Climate Design Considerations (2.7.5.G)	Response	Attachment location
20	Have the potential impacts of Vermont's severe winter climate been addressed in your design?	yes	Attachment 4 - Plan Set

Channel Protection Treatment Standard (Cpv)	Response
Check which detention time standard must be used, based on the fisheries designation of the receiving water:	☑ 12 hours for cold water ☐ 24 hours for warm water

		Response	Attachment location
22	Did you use the Storage Volume Estimation Method? If yes, skip to Line 25.*	n/a	CPv waived

*Please review the guidance sheet "Channel Protection Storage Volume Estimation" and attach the specified information. This method is not appropriate if more than a one subwatershed drains to the practice. Using the center of mass detention time calculated by a hydrologic model that accounts for pond routing is the preferred method.

23	What storage volume (cubic feet) necessary to meet the Channel Protection Standard?	CPv waived
24	What is the calculated average release rate (cfs)?	CPv waived
25	What is the controlled peak release rate (cfs) during the 1-year storm as indicated by the model?	CPv waived

	Overbank Flood Protection Treatment Standard (Qp10)	Response	Attachment location
25	Have you demonstrated that Qp10 post is less than or equal to Qp10 pre at the discharge point?*	n/a	Qp10 waived

*Please include runoff and routing calculations of the 10-year storm event.

	Extreme Flood Protection Treatment Standard (Qp100)	Response	Attachment location
26	Have you demonstrated that Qp100 post is less than or equal to Qp100 pre at the discharge point?*	n/a	Qp100 waived

*Please include runoff and routing calculations of the 100-year storm event.

*Grass channels provide rate-based treatment and must be designed to provide 10 minutes of residence time for the peak WQ discharge (a 0.9 inch storm). Traditional methods underestimate the volume and rate of runoff for storms of less than 2 inches. Modified curve numbers must be used. Because this practice is rate-based, both on and off-site water reaching the grass channel must be included in the calculations. This additional water will affect the velocity and residence time of the water in the channel. The average residence time for the peak discharge corresponds to the residence time calculated at the peak/maximum velocity, which is reported as the minimum residence time.

Attachment location: Please indicate the specific location (i.e. appendix, page, plan sheet) where the requisite support documentation has been provided within the application.

Project Name: MMMUSD Proposed Parking and Circulation Improvements **Discharge Point:** S/N001

Channel Protection Standard Treatment Standard Waiver Worksheet

Fill out this worksheet for <u>each</u> discharge point in which use of this waiver is sought.

Channel Protection Standard Treatment Standard (CPv) Waiver (*check <u>only</u> one*):

☑ 1. Expansions involving less than or equal to one (1) acre of impervious cover.

Enter the new/expanded impervious area (acres):	0.63

☐ 2. A site where the pre-routed, post-development discharge is less than 2 cubic feet per second (cfs).

Enter the total pre-routed post development discharge rate (cfs):	

<u>Guidance</u>: Pre-routed post development flow is the runoff from the site area <u>without</u> detention provided. However, this runoff flow should include all post-development conveyance. The site is equal to the disturbed area. When examining whether or not the site qualifies for this waiver, off-site runoff does <u>not</u> need to be considered. Please attach the runoff calculations/hydrologic modeling for the pre-routed, post-development during the 1-year, 24-hour storm event.

☐ 3. A site that directly discharges to a waterbody with a drainage area equal or greater than 10 square miles, and that is less than 5% of the watershed area at the site's upstream boundary.

Name of Receiving Water at Discharge Point:	
Drainage Area of Receiving Water at Discharge Point (square miles):	

<u>Guidance</u>: "Directly discharges" means that the runoff from the project does not reach any water of the State before discharging to the waterbody with a equal or greater than 10 square mile watershed. If the discharge point definition is unclear, refer to the Schedule A document and/or contact the Stormwater Program.

These waivers are applied per receiving water. For example, if discharge point S/N 001 drains directly to the Winooski River (greater than 10 square miles), but discharge point S/N 002 drains to a small tributary of the Winooski River, then S/N 001 could be waived from the Channel Protection Treatment Standard using waiver 3, but S/N 002 could not. However, S/N002 may be eligible for the other waivers.

Project Name: MMMUSD Proposed Parking and Circulation Improvements **Discharge Point:** S/N001

Overbank Flood Protection Standard Treatment Standard Waiver Worksheet

Fill out this worksheet for <u>each</u> discharge point in which use of this waiver is sought.

Overbank Flood Protection Standard Treatment Standard (Qp10) Waiver (*check <u>only</u> one*):

☑ 1. The site directly discharges to a large reservoir, lake or stream with a drainage area greater than or than 10 square miles.

Name of Receiving Water at Discharge Point:	Browns River
Drainage Area of Receiving Water at Discharge Point (square miles):	19.9

<u>Guidance</u>: "Directly discharges" means that the runoff from the project does not reach any water of the State before discharging to the waterbody with a equal or greater than 10 square mile watershed. If the discharge point definition is unclear, refer to the Schedule A document and/or contact the Stormwater Program.

☐ 2. The site is smaller than 5 acres and the channel has adequate capacity to convey the post-development 10-year discharge downstream to the point of the 10% rule; and downstream conveyances have adequate capacity to convey the 10 year storm.

Is the site area less than five (5) acres?	☐ Yes	☐ No
Has adequate conveyance from the site to the discharge point been verified?	☐ Yes	☐ No
Has supporting information (e.g. narrative description, calculations, modeling) been included?	☐ Yes	☐ No

These waivers are applied per receiving water. For example, if discharge point S/N 001 drains directly to the Winooski River (greater than 10 square miles), but discharge point S/N 002 drains to a small tributary of the Winooski River, then S/N 001 could be waived from the Overbank Flood Protection Standard Treatment Standard using waiver 1, but S/N 002 could not. However, S/N002 may be eligible for the other waiver.

Project Name: MMMUSD Proposed Parking and Circulation Improvements Discharge Point: S/N001

Extreme Flood Protection Standard Treatment Standard Waiver Worksheet

Fill out this worksheet for <u>each</u> discharge point in which use of this waiver is sought.

Extreme Flood Protection Standard Treatment Standard (Qp100) Waiver (*check <u>only</u> one*):

☑ 1. The site directly discharges to a large reservoir, lake or stream with a drainage area greater than or than ten (10) square miles.

Name of Receiving Water at Discharge Point:	Browns River
Drainage Area of Receiving Water at Discharge Point (square miles):	19.9

<u>Guidance</u>: "Directly discharges" means that the runoff from the project does not reach any water of the State before discharging to the waterbody with a equal or greater than 10 square mile watershed. If the discharge point definition is unclear, refer to the Schedule A document and/or contact the Stormwater Program.

☐ 2. The impervious area is less than or equal to ten (10) acres.

Enter the new/expanded impervious area (acres):	

<u>Guidance</u>: The ten (10) acre treatment requirement applies to only new impervious – created since July 4, 2005.

☐ 3. A downstream analysis is conducted that indicates extreme flood control is not necessary for the site.

Has adequate conveyance from the site to the discharge point been verified?	☐ Yes	☐ No
Has supporting information (e.g. narrative description, calculations, modeling) been included?	☐ Yes	☐ No

Note: These waivers are applied per receiving water.

Project Name: MMMUSD Proposed Parking and Circulation Improvements **Discharge Point:** S/N001

3.3 – Disconnection of Non-Rooftop Runoff Credit

Fill out this worksheet for each discharge point drainage area in which you have disconnected all or a portion of your non-rooftop runoff.

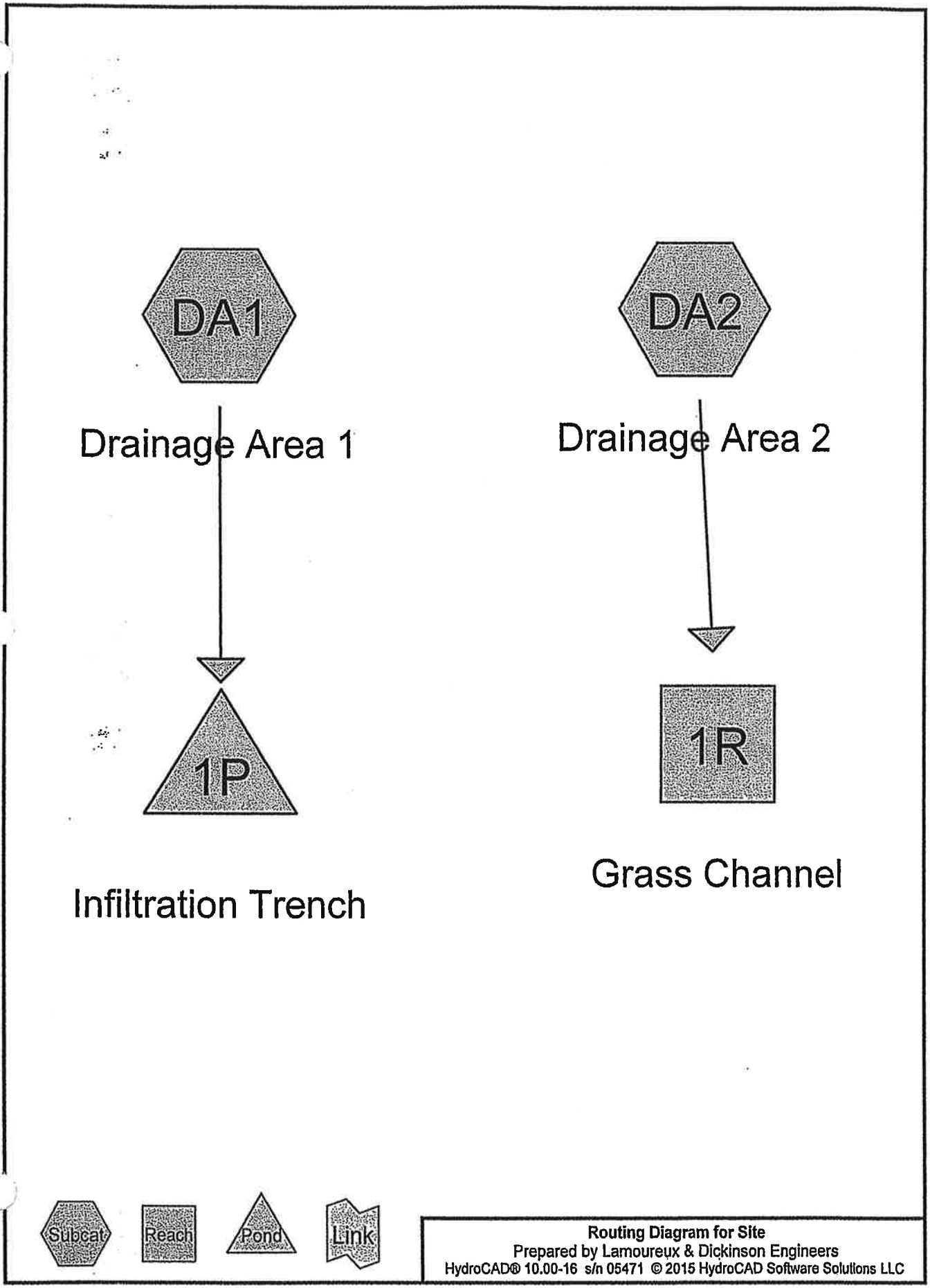
Line	Disconnection of Non-Rooftop Runoff Credit Criteria:	Response	
1	Has a typical disconnection detail been included on the site plans?	☑ Yes	☐ No*
2	Is the disconnection on a slope less than or equal to 5%?	☑ Yes	☐ No*
3	Is the maximum contributing length of non-rooftop 75 feet or less?	☑ Yes	☐ No*
4	Is the maximum contributing area less than 1000 square feet? Note: This criterion applies to collected, routed non-rooftop runoff.	☐ Yes	☑ N/A
5	Is the length of the disconnection at least equal to the contributing length?	☑ Yes	☐ No*
6	Does the disconnected runoff drain either as sheet flow or into a subsurface drain that is not directly connected to the drainage network?	☑ Yes	☐ No*
	Have disconnections located on HSG C or D soils been evaluated to determine if disconnection is appropriate?	☐ Yes	☑ N/A
8	Does the disconnected non-rooftop runoff drain from a "hotspot" land use area?	☑ N/A	☐ No
9	***If No**, please explain why below? Note: To be eligible for the credit all minimum criteria must be met.		

For additional information please go to the Vermont Stormwater Management Manual, Volume 1, Section 3 – Voluntary Stormwater Management Credits.

Attachment 3a

WQv Grass Channel

WQv Infiltration Trench



Routing Diagram for Site
Prepared by Lamoureux & Dickinson Engineers

Summary for Subcatchment DA1: Drainage Area 1

Runoff = 0.58 cfs @ 11.91 hrs, Volume= 0.024 af, Depth= 0.58"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type II 24-hr WQv Rainfall=0.90"

Area (ac)	CN	Description
0.420	98	Paved parking, HSG A
0.080	39	>75% Grass cover, Good, HSG A
0.500		Weighted Average
0.080	39	16.00% Pervious Area
0.420	98	84.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	60	0.0100	2.03		**Shallow Concentrated Flow, Sheet flow ascross new parking ar** Paved Kv= 20.3 fps

Summary for Subcatchment DA2: Drainage Area 2

Runoff = 0.48 cfs @ 12.05 hrs, Volume= 0.029 af, Depth= 0.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type II 24-hr WQv Rainfall=0.90"

	Area (ac)	CN	Description
*	0.820	94	Mod CN
	0.820	94	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.6	100	0.0250	0.16		**Sheet Flow, Flow from building to parking lot** Grass: Short n= 0.150 P2= 2.30"
0.5	36	0.0250	1.11		**Shallow Concentrated Flow, Flow from building to parking lot** Short Grass Pasture Kv= 7.0 fps
0.6	83	0.0150	2.49		**Shallow Concentrated Flow, Flow across paved parking lot** Paved Kv= 20.3 fps
1.2	83	0.0290	1.19		**Shallow Concentrated Flow, Flow from parking to new CB** Short Grass Pasture Kv= 7.0 fps
12.9	302	Total			

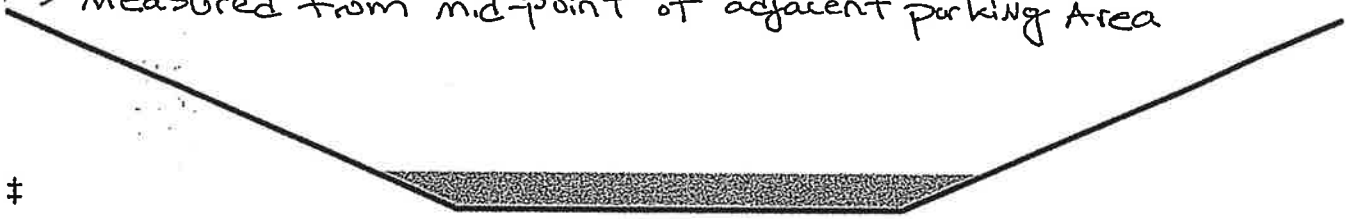
Summary for Reach 1R: Grass Channel

Inflow Area = 0.820 ac, 0.00% Impervious, Inflow Depth = 0.42" for WQv event
Inflow = 0.48 cfs @ 12.05 hrs, Volume= 0.029 af
Outflow = 0.36 cfs @ 12.31 hrs, Volume= 0.029 af, Atten= 25%, Lag= 15.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.32 fps, Min. Travel Time= 10.3 min
Avg. Velocity = 0.08 fps, Avg. Travel Time= 40.2 min

Peak Storage= 223 cf @ 12.13 hrs
Average Depth at Peak Storage= 0.19' = 2.3"
Bank-Full Depth= 1.00' Flow Area= 10.0 sf, Capacity= 7.96 cfs

5.00' x 1.00' deep channel, n= 0.150
Side Slope Z-value= 5.0 '/' Top Width= 15.00'
Length= 195.0' Slope= 0.0113 '/'
Inlet Invert= 673.20', Outlet Invert= 671.00'
→ measured from mid-point of adjacent parking Area



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Summary for Pond 1P: Infiltration Trench

Inflow Area =	0.500 ac, 84.00% Impervious, Inflow Depth = 0.58"		for WQv event	
Inflow =	0.58 cfs @	11.91 hrs, Volume=	0.024 af	
Outflow =	0.15 cfs @	11.99 hrs, Volume=	0.024 af,	Atten= 74%, Lag= 5.2 min
Discarded =	0.15 cfs @	11.99 hrs, Volume=	0.024 af	
Primary =	0.00 cfs @	0.00 hrs, Volume=	0.000 af	

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 671.99' @ 11.99 hrs Surf.Area= 0.010 ac Storage= 0.005 af

Plug-Flow detention time= 5.9 min calculated for 0.024 af (100% of inflow)
Center-of-Mass det. time= 5.9 min (788.9 - 783.1)

Volume	Invert	Avail.Storage	Storage Description
#1	670.90'	0.007 af	**5.00'W x 87.00'L x 2.00'H Prismatoid** 0.020 af Overall - 0.002 af Embedded = 0.018 af x 40.0% Voids
#2	671.40'	0.002 af	**15.0" Round Pipe Storage** Inside #1 L= 87.0'
		0.009 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	670.90'	**15.000 in/hr Exfiltration over Surface area below 670.91'** Conductivity to Groundwater Elevation = 1.00'
#2	Primary	672.15'	**6.0" Vert. Orifice** C= 0.600

Discarded OutFlow Max=0.15 cfs @ 11.99 hrs HW=671.99' (Free Discharge)
↑—**1=Exfiltration** (Controls 0.15 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=670.90' (Free Discharge)
↑—**2=Orifice** (Controls 0.00 cfs)

Hydrograph for Pond 1P: Infiltration Trench

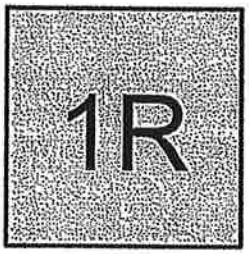
Time (hours)	Inflow (cfs)	Storage (acre-feet)	Elevation (feet)	Outflow (cfs)	Discarded (cfs)	Primary (cfs)
0.00	0.00	0.000	670.90	0.00	0.00	0.00
2.00	0.00	0.000	670.90	0.00	0.00	0.00
4.00	0.00	0.000	670.90	0.00	0.00	0.00
6.00	0.00	0.000	670.90	0.00	0.00	0.00
8.00	0.00	0.000	670.90	0.00	0.00	0.00
10.00	**0.01**	**0.000**	**670.90**	**0.01**	**0.01**	0.00
12.00	**0.11**	**0.005**	**671.99**	**0.15**	**0.15**	0.00
14.00	0.01	0.000	670.90	0.01	0.01	0.00
16.00	0.01	0.000	670.90	0.01	0.01	0.00
18.00	0.01	0.000	670.90	0.01	0.01	0.00
20.00	0.00	0.000	670.90	0.00	0.00	0.00
22.00	0.00	0.000	670.90	0.00	0.00	0.00
24.00	0.00	0.000	670.90	0.00	0.00	0.00
26.00	0.00	0.000	670.90	0.00	0.00	0.00
28.00	0.00	0.000	670.90	0.00	0.00	0.00
30.00	0.00	0.000	670.90	0.00	0.00	0.00
32.00	0.00	0.000	670.90	0.00	0.00	0.00
34.00	0.00	0.000	670.90	0.00	0.00	0.00
36.00	0.00	0.000	670.90	0.00	0.00	0.00
38.00	0.00	0.000	670.90	0.00	0.00	0.00
40.00	0.00	0.000	670.90	0.00	0.00	0.00
42.00	0.00	0.000	670.90	0.00	0.00	0.00
44.00	0.00	0.000	670.90	0.00	0.00	0.00
46.00	0.00	0.000	670.90	0.00	0.00	0.00
48.00	0.00	0.000	670.90	0.00	0.00	0.00
50.00	0.00	0.000	670.90	0.00	0.00	0.00
52.00	0.00	0.000	670.90	0.00	0.00	0.00
54.00	0.00	0.000	670.90	0.00	0.00	0.00
56.00	0.00	0.000	670.90	0.00	0.00	0.00
58.00	0.00	0.000	670.90	0.00	0.00	0.00
60.00	0.00	0.000	670.90	0.00	0.00	0.00
62.00	0.00	0.000	670.90	0.00	0.00	0.00
64.00	0.00	0.000	670.90	0.00	0.00	0.00
66.00	0.00	0.000	670.90	0.00	0.00	0.00
68.00	0.00	0.000	670.90	0.00	0.00	0.00
70.00	0.00	0.000	670.90	0.00	0.00	0.00
72.00	0.00	0.000	670.90	0.00	0.00	0.00

WqV dewatered in < 10 hrs.

Attachment 3b

10-Yr Grass Channel

Drainage Area 2



Grass Channel

Routing Diagram for Site
Prepared by Lamoureux & Dickinson Engineers

Summary for Subcatchment DA2: Drainage Area 2

Runoff = 2.75 cfs @ 12.04 hrs, Volume= 0.174 af, Depth= 2.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type II 24-hr 10 year Rainfall=3.20"

	Area (ac)	CN	Description
*	0.820	94	Mod CN
	0.820	94	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.6	100	0.0250	0.16		**Sheet Flow, Flow from building to parking lot** Grass: Short n= 0.150 P2= 2.30"
0.5	36	0.0250	1.11		**Shallow Concentrated Flow, Flow from building to parking lot** Short Grass Pasture Kv= 7.0 fps
0.6	83	0.0150	2.49		**Shallow Concentrated Flow, Flow across paved parking lot** Paved Kv= 20.3 fps
1.2	83	0.0290	1.19		**Shallow Concentrated Flow, Flow from parking to new CB** Short Grass Pasture Kv= 7.0 fps
12.9	302	Total			

Summary for Reach 1R: Grass Channel

Inflow Area = 0.820 ac, 0.00% Impervious, Inflow Depth = 2.54" for 10 year event
Inflow = 2.75 cfs @ 12.04 hrs, Volume= 0.174 af
Outflow = 2.43 cfs @ 12.19 hrs, Volume= 0.174 af, Atten= 11%, Lag= 8.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.57 fps, Min. Travel Time= 5.7 min 0.57 fps = non-erosive
Avg. Velocity = 0.13 fps, Avg. Travel Time= 25.2 min

Peak Storage= 829 cf @ 12.10 hrs
Average Depth at Peak Storage= 0.55'
Bank-Full Depth= 1.00' Flow Area= 10.0 sf, Capacity= 7.96 cfs

5.00' x 1.00' deep channel, n= 0.150
Side Slope Z-value= 5.0 '/' Top Width= 15.00'
Length= 195.0' Slope= 0.0113 '/'
Inlet Invert= 673.20', Outlet Invert= 671.00'